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Title:
TIRE WITH MIXED COLORS

Abstract

The invention concerns a tire P provided with a radial body reinforcement (1) and a top reinforcement (3) consisting of at least two breaker strips (31 and 32) of inextensible reinforcing elements, preferably metallic, crossworked from one strip to the next forming with the circumferential direction an angle between 5 and 45°, and radially external to a running tread (8). The invention is characterized in that said running tread, consisting of rubber mixtures of different colors, is axially formed of at least three longitudinal portions, two lateral portions (81) of a first color rubber mixture, and at least axially between said two portions (81), a portion (80) of a second non-black color rubber mixture, each axial end A, visible from outside of the colored portion with the second color being spaced from the end, located on the same side relative to an equatorial plane of the ply (31, 32) least wide axially by a distance at least equal to 30 mm.

The present invention concerns a tire for a passenger car whose outer surfaces are of different colors, and in particular, a tire with a nonwhite color on the side walls and at least one nonblack color on the tread.

With the advent of rubber mixtures containing silica instead of carbon black as principal filler, it is possible to create white and/or colored mixtures other than black or white by adding coloring pigments. A nonblack color mixture can be used as the only component of the tread or in combination with a usual black mixture and/or another color mixture. In the case of association of mixtures of different colors in one tread and to make wear of said tread uniform while preserving a high wear potential level, the chemical constitution of the different rubber mixtures must be investigated as a consequence.

The combination of several mixtures of different constitution in the same tread to obtain an almost identical rate of wear for said different mixtures can cause major drawbacks for the lifetime of the radial tire when said mixtures are structurally arranged in any way, where the tire contains crown reinforcement formed of at least two crown plies of inextensible and crossed reinforcing elements radially surmounting radial casing reinforcement. In

particular, complex phenomena of migration between mixtures of certain constitutive additives can harmfully influence the endurance on the level of detachments and separations between ends of said c"crossed" crown plies of the radial tire and/or detachments between crown reinforcement and casing reinforcement when the lifetime of the tire becomes too long.

To remedy said drawbacks, the tire according to the invention, equipped with radial casing reinforcement, crown reinforcement composed of at least two crown plies of inextensible reinforcing elements, preferably metallic, parallel to each other in each ply and crossed from one ply to the next, forming an angle with the circumferential direction which can be between 5° and 45° and radially to the outside of a tread, is characterized by the fact that said tread, composed of rubber mixtures of different colors, is axially formed of at least three longitudinal parts, two side parts of rubber mixture of a first color, radially covering the axial ends of the crown plies of inextensible reinforcing elements, and at least, axially between the two said parts, one part of rubber mixture of a second color different from the first and not black, where each axial end A, visible from the outside of the tire, of the part colored with a second color is distant from the end, located on the same side with respect to the equatorial plane of the tire, of the axially narrowest "crossed" crown ply, by a quantity at least equal to 30 mm.

The best uniformity of wear—crown reinforcement endurance compromise is obtained when the two lateral parts of the tread are black.

Between the two lateral parts, there can be only one central part of rubber mixture of a second color or one central part axially connected to the two lateral parts of the first color by two intermediate parts, where the colored part of the tread with a second color can then be

either an intermediate part or two intermediate parts, and the central part can be of the first color or of different color than the second color of the intermediate parts.

The radial thickness of the nonblack color mixture can have a value between the total thickness of the tread, measured in the equatorial plane, and a value equal to the radial distance separating the tread surface from the radially external surface of the tread wear indicators placed at the bottom of the grooves. Said thickness, for reasons of ease and manufacturing cost, is advantageously equal to the thickness of the tread.

The improvement in the endurance of the crown reinforcement of such a tire can be completed by the presence of at least one additional ply of circumferential reinforcing elements above the crown plies of crossed reinforcing elements, where this ply has an axial width greater than the width of the widest "crossed" crown ply, and said additional ply fulfills two functions: a reinforcing function as is known, but also a screening function with respect to migration of mixing additives and particularly anti-aging additives due to its thickness and the composition of its calendering.

It is particularly advantageous to use two plies of circumferential reinforcing elements, preferably made of aliphatic polyamide, where the two plies have widths greater than the width of the widest "crossed" crown ply. For maximum efficacy, the axially narrowest ply of circumferential elements will have a width equal to at least 105% of the width of the widest "crossed" crown ply, where the latter is greater than the width of the contact surface between the ground and the tread of the tire inflated to its operating pressure and bearing its nominal load.

In order to have the most uniform possible transverse tread wear despite the presence of at least two mixtures of different composition and color on one hand and to minimize the risks of detachment between products on the tread surface on the other hand, ends A, visible from the outside of the tire, of the two axial edges of each part of the second color will be located in the bottoms of circumferential grooves, axially delimiting said part of second color, where said circumferential grooves are preferably longitudinal.

The colored tire according to the invention contains at least one of the walls, at least partially, of nonblack color with an arrangement of the rubber mixtures known per se, where the color mixture axially to the outside is delimited radially by two wall protuberances axially protruding to the outside. The curvilinear distance separating the radially upper end of the colored wall mixture of the axially external end of the widest "crossed" crown ply is advantageously equal to at least 30 mm.

The characteristics and advantages of the present invention will appear more clearly in reading the description which follows and to which the drawing is attached, where the single figure shows in meridian section a tire according to the invention.

Tire P comprises a casing reinforcement (1) composed of two plies of polyester radial cords and anchored by turn-up (10) with at least one wire (2) in each bead. The casing reinforcement (1) is radially surmounted by a crown reinforcement (3) formed of two plies (31) and (32) of the same name, reinforced with inextensible metallic cords crossed from one ply to the next, where radially interior ply (31) has an axial width L_{31} greater than the axial width L_{32} of the crown ply radially most to the outside. In the described example of a 155/70.R.13 tire, width L_{31} is equal to 123 mm. Width L_{32} is smaller than L_{31} and equal to

110 mm, while the axial width of the contact surface between the ground and tire bearing its nominal load of 380 kg and inflated to its operating pressure of 2.5 bars is 109 mm. As known per se, each edge of ply (31) is separated from the outermost casing ply by a rubber section (4) of low thickness, where the edges respectively of plies (31) and (32) are separated by a rubber border layer (5) with a thickness equal to 0.5 mm, and the edges of the narrowest ply (32) are also radially covered by a border layer (6) with a thickness of 0.5 mm.

The above "crossed" plies and border rubber assembly is radially covered on the outside by two plies (71) and (72) of circumferential reinforcing elements, where said elements are aliphatic polyamide textile cords coated in a calendering mixture adapted to such cords. The widths of plies (71) and (72), equal to each other, are greater than the widths of plies (31) and (32) to axially cover the edges of the widest "crossed" ply (31) of the crown reinforcement.

Tread (8), covering the system of the plies, contains three longitudinal parts: one central part (80) and two side parts (81). Said parts (81) are composed of a rubber mixture of black color and whose constitution was selected to have wear properties approximately identical to the properties of the same brand of the nonblack color mixture constituting the central part (80). The axial edges of said central part (80) are such that the ends A of these edges, visible on the outside, are located in the bottoms of longitudinal grooves (83) axially delimiting said central part (80). Each axial and visible end of central part A is distant from the end of the narrowest "crossed' crown ply (32) located on the same side with respect to the median plane of the rubber ring of nonblack color by a quantity L_0 equal to 35 mm, i.e., 32% of axial length L_{32} of said ply (32).

As for the radial thickness h of the central part (80) of nonblack color, it is, in the case described, equal to thickness H of tread (8), where said thickness, measured in the equatorial plane, is the radial distance between the tread surface and the radially outermost crown ply.

Tread (8) is connected on either side of the equatorial plane to the tire bead by wall (9), which also contains a colored part. Said part (90), radially delimited by two protuberances (91), is composed, in going from the outside to the inside, of a layer of colored rubber mixture (92) (where black is excluded) axially adjacent to a layer (93) of rubber mixture more particularly resistant to the phenomenon of initiation of fracture, where said layer (93) is itself connected to an ordinary wall layer (94) by a layer (95) of rubber mixture intended to prevent to the maximum migration of products from layer (94).

CLAIMS

1. Tire P for passenger car equipped with radial casing reinforcement (1) and crown reinforcement (3) composed of at least two crown plies (31) and (32) of inextensible reinforcing elements, preferably metallic, parallel in each ply and crossed from one ply to the next, forming with the circumferential direction an angle which can be between 5° and 45° and radially to the outside tread (8), characterized by the fact that said tread (8), composed of rubber mixtures of different colors, is axially formed of at least three longitudinal parts, two lateral parts (81) of rubber mixture of a first color radially covering the axial ends of the crown plies of inextensible reinforcing elements (31, 32), and at least axially between the two said parts (81), a part (80) of rubber mixture of a second color, different from the first and

not black, where each axial end A, visible from the outside of the tire, of part (80) colored with a second color is distant from the end, located on the same side with respect to the equatorial plane of the tire, of the axially narrowest "crossed" summit ply (31, 32) by a quantity at least equal to 30 mm.

2. Tire P according to claim 1, characterized by the fact that the two lateral parts (81) of the tread (8) are black.

3. Tire P according to one of claims 1 or 2, characterized by the fact that tread (8) is formed of three parts, where the unique central part (80) is composed of a rubber mixture of a second color.

4. Tire P according to one of claims 1 or 2, characterized by the fact that part (80) of rubber mixture of the second color, contained between the two side parts (81), is subdivided into two intermediate strips located on either side of the equatorial plane of the tire.

5. Tire P according to claim 4, characterized by the fact that the intermediate strips are axially connected by a central strip of rubber mixture of the first color.

6. Tire P according to one of claims 1-5, characterized by the fact that at least one additional ply (71) of circumferential reinforcing elements is positioned radially above working crown plies (31), (32), where said ply (71) has a axial width greater than the width of the widest "crossed" crown ply.

7. Tire P according to claim 6, characterized by the fact that two additional plies (71) and (72) of circumferential reinforcing elements are positioned radially above crown plies (31), (32), where said plies (71) and (72) have axial widths greater than the width of the widest "crossed" ply.

8. Tire P according to one of claims 6 or 7, characterized by the fact that the circumferential reinforcing elements are made of aliphatic polyamide.

9. Tire P according got one of claims 1-8, characterized by the fact that the radial thickness h of part (80) of rubber mixture of the second color has a value at most equal to the total thickness H of tread (8), measured in the equatorial plane, and a value at least equal to the radial distance separating the surface of tread (8) from the radially external surface of the wear indicators placed at the bottom of the grooves.

10. Tire P according to claim 9, characterized by the fact that the radial thickness h of part (80) of the second color is equal to the thickness H of the tread (8), where said thickness, measured in the equatorial plane, is the radial distance between the tread surface and radially outermost crown ply (72).

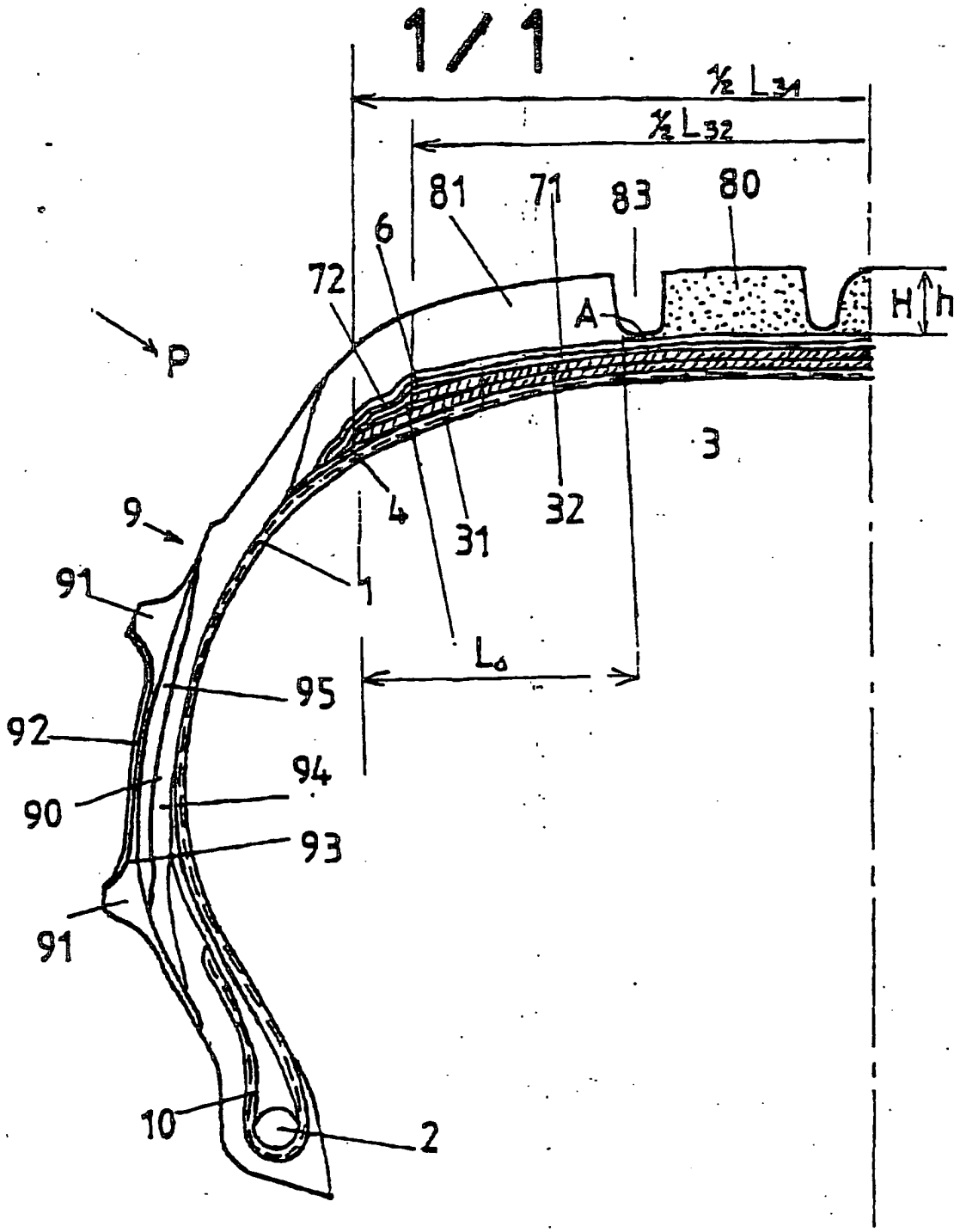
11. Tire according to one of claims 1-10, characterized by the fact that axial ends A of part (80) of rubber mixture of the second color other than black, visible from the outside, are located in the bottoms of circumferential grooves (83) axially delimiting said part (80).

12. Tire P according to claim 11, characterized by the fact that circumferential grooves (83) are longitudinal.

13. Tire according to one of claims 13 [*sic*], characterized by the fact that it contains at least one of walls (9), at least partially nonblack in color, where the axially external color mixture (92) is radially delimited by two wall protuberances (91) axially protruding to the outside.

14. Tire P according to claim 14, characterized by the fact that the layer of rubber mixture (92) of nonblack color is, axially to the inside, adjacent to a layer (93) of rubber

mixture more particularly resistant to the phenomenon of initiation of fracture, where said layer (93) is itself axially connected to the inside with a wall layer (94) of ordinary rubber composition by an intermediate layer (95) of rubber mixture to prevent to the maximum migration of products from layer (94).


½ L31
½ L32
81
71
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80
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A
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h
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9
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91
L6
95
92
94
90
93
91
10
2

FIG 1